

What is claimed is:

1. A method for changing the orientation of fibers in a nonwoven web
 5 wherein a portion of the fibers are oriented in substantially the machine direction and
 a portion of the fibers are oriented in substantially the cross-machine direction
 comprising the steps of

providing a plurality of fluid jets offset at an appreciable angle from the
 perpendicular with respect to the web,

- 10 applying a plurality of fluid streams from the jets onto a surface of the
 nonwoven web at a pressure sufficient to move the fibers into a different orientation
 wherein the streams form a substantially coplanar curtain,

locking the perturbed fibers of the nonwoven web to maintain the different
 orientation of the fibers.

- 15 2. The method of Claim 1 wherein the fluid jets are oriented at an angle
 such that the streams impinge on the leading ends of fibers that are oriented
 substantially in the machine direction.

Fig. 2A
Fig. C

3. The method of Claim 1, wherein the fluid jets are oriented at an angle
 such that the streams impinge on the trailing ends of fibers that are oriented
 20 substantially in the machine direction.

Fig. 2B
Fig. C

4. The method of Claim 1, wherein the fluid jets are oriented at an angle
 such that the streams impinge on the sides of fibers that are oriented substantially in
 the machine direction.

5. The method of Claim 1, wherein the fluid jets are at an angle in the
 25 range of 10 to 50 degrees with respect to a plane that is perpendicular to the machine
 direction and parallel to the cross-machine direction of the nonwoven web.

Fig. 2 or 5?

6. The method of Claim 5, wherein the fluid jets are at an angle in the
 range of 20 to 30 degrees.

7. The method of Claim 1, wherein the fluid jets are arranged in at
 30 least two rows such that the curtains from the fluid jets are oriented at an angle with
 respect to the vertical and are offset from each other at a some angle between about 5
 degrees and 30 degrees, thereby simultaneously providing perturbation of fibers from
 their leading edges, trailing edges and sides.

Fig. 5-6

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8. The method of Claim 1, wherein the fluid is selected from the group consisting of gas and liquid.
9. The method of Claim 8, wherein the fluid is water.
- 5 10. The method of Claim 8, wherein the fluid is air.
11. The method of Claim 1 wherein the nonwoven web is made by a process selected from group consisting of hydroentangling, spunbonding, carding, meltblowing, airlaying and combinations thereof.
12. The method of claim 1, wherein the nonwoven web has an increase in
10 opacity of about 2.5%.
13. A method for changing the orientation of fibers in a nonwoven web produced by hydroentangling wherein a portion of the fibers are oriented in substantially the machine direction and a portion of the fibers are oriented in substantially the cross-machine direction comprising the steps of
15 (a) providing a first plurality of fluid jets offset at an appreciable angle from the perpendicular with respect to the web,
(b) applying a plurality of fluid streams from the jets of step (a) onto a surface of the nonwoven web at a pressure sufficient to move the fibers into a different position wherein the streams form a substantially coplanar curtain,
20 (c) providing a first plurality of nonangled fluid jets,
(d) applying a first plurality of fluid streams from the first plurality of nonangled jets onto the nonwoven web of step (b), wherein the streams form a substantially coplanar curtain
(e) providing a second plurality of fluid jets offset at an appreciable
25 angle from the perpendicular with respect to the web,
(f) applying a plurality of fluid streams from the jets of step (e) onto the nonwoven web of step (d) at a pressure sufficient to move the fibers into a different position wherein the streams form a substantially coplanar curtain,
(g) providing a second plurality of nonangled jets,
30 (h) applying a plurality of fluid streams from the second plurality of nonangled jets onto the nonwoven web of step (f), wherein the streams form a substantially coplanar curtain.

distinct in examples

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14. A jet strip having at least one row of a plurality of closely spaced holes therein angled at least about 5 degrees from the vertical and such that the aggregate of individual fluid streams issuing from each of the holes effectively forms a curtain of
- 5 fluid.

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